

This paper describes the use of simulation modeling technique to support the management of family planning programs, using data in an organized way for problem diagnosis, forecasting and the examination of alternative strategies.

Using a Model as a Practical Management Tool for Family Planning Programs

Introduction

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One point of departure for examining the use of information and reporting systems by managers in an organization, including those concerned with family planning, should be a review of what those managers actually do. What activities are carried out? What kinds of decisions does the manager face? What information supports these activities—and how, in fact, is the information used to meet managerial needs?

In organizing this discussion of local family planning program management, we will briefly: 1) introduce a framework to define and position the decisions faced by family planning managers; 2) use this framework to outline the areas in which most management information system work has been done to date and where substantial work remains to be done; and 3) present an approach to the structuring of some strategic planning decisions related to family planning: Specifically, experience with a planning model, use of supporting data systems, and a particular application in Atlanta, Georgia, will be discussed.

A Framework for Management Decisions in Family Planning

Anthony¹ has suggested segmenting managerial decision activities into three categories:

- Operational Control
- Management Control
- Strategic Planning

In brief, these categories may be defined as follows:

Operational Control

Operational Control is the process of assuring that specific tasks are carried out efficiently and effectively. Examples of operational control activities in family planning programs would include:

Scheduling of visits—When should a patient on pills make the next visit?

Inventory control—Do we have enough pills in stock or should we reorder?

Client record maintenance—Does the patient's history, previous record of visits, or physical exam indicate that further attention is required?

Accounting systems—When and how much should staff be paid?

Staff scheduling—Which nurses, midwives, fieldworkers, physicians, etc., will be assigned to each work location and work period?

Management Control

Management Control is the process by which managers assure that resources are obtained and used effectively in accomplishment of the organization's objectives. Examples of family planning management control activities would include:

Short-term staffing and capacity requirements—With expected program growth, how many nurses, midwives, fieldworkers will be needed?

Scheduling of mobile teams and supervisory personnel—When and where should the teams be sent for adequate coverage? What priority should local problems have in assigning supervisory support?

Performance monitoring ("evaluation")—How are local units/areas doing relative to assigned objectives and milestones? Which areas are doing substantially better or worse than expected? What accounts for the variance?

Target setting—What intermediate objectives, such as numbers of acceptors and continuing active users are required to achieve stated goals? How should these targets be assigned to service units and individuals?

Short-term budgeting—What financial resources are required to meet planned needs in the months ahead? Does today's situation indicate that reallocation of existing funds would better meet actual conditions?

Incentive systems—What rewards will stimulate personnel and clients in accord with program objectives?

Fieldwork allocation—What balance should be drawn between follow-up and recruitment of new patients?

Media scheduling—What placement, timing and frequency of messages should be used?

Training—What skills and experiences are required? Which are available and which must be developed?

Strategic Planning

Strategic planning is the process of deciding on the objectives of the organization, the resources used to attain these objectives, and the policies that are to govern the use of resources. Examples of strategic planning activities include:

Program objectives—What program results are sought?

Service Facility Location—What location should be selected and why?

Target population definition—What defines it? Where are the people located? Does theoretical clarity of definition at the central administration level mean anything realistically in the field?

Longer range budgeting and forecasting—What financial and human resources will be required to build toward program goals? Where will they come from? What proportions of private and public inputs are realistic?

Resource allocation and policy options—What constitutes acceptable program elements? Will private sector activities be encouraged? What methods will be offered? Is abortion supported? What are the costs and benefits of building family planning into MCH and other health services? How broadly will community involvement be sought?

Structured and Unstructured Decisions

Figure 1 outlines some of the managerial decisions in family planning mentioned above, and adds an additional dimension relevant to the use of reporting and information systems: The distinction between management decisions that are structured, and those that are less structured.² The structured/unstructured distinction refers to the ways in which a manager deals with a problem, and suggests that a problem is structured to the extent that: 1) it can be clearly defined; 2) alternative courses of action can be analyzed; and 3) the best course of action can be chosen. The structured/unstructured dimension is important because it points out where we are now in the development and use of management tools to aid family planning decision-makers. Indeed, a case can be made that one index of the progress of management knowledge is reflected in the extent to which problems and decisions evolve into more structured, explicit forms over time. As we are better able to analyze and document on paper the factors and relationships perceived to be relevant to a decision, we structure it. We are converting an informal, implicit (or internal) mental model of the problem into a structured, explicit model.

Past Work and Future Needs

The framework of management decision activities in Figure 1 provides insight into the areas where work has been done and where needs and opportunities exist for additional work. To date, the bulk of implemented work in formalized management information systems has been concentrated on activities in the upper left-hand portion of Figure 1, in the structured management control areas. Experience with the coupon systems from Korea and Taiwan³ has

been well-documented, and rapid feedback systems for client monitoring, as described from the Philippines,⁴ Guatemala,⁵ Jamaica⁶ and a number of programs in the U.S.⁷ are evidence of the pace at which effective information system tools are evolving in this area. The Philippine program deserves recognition as being at the forefront in implementing practical tools to attack family planning data handling problems, including inventory control, and accounting procedures as well as in client record systems. Steps to develop generalized computer processing programs to minimize the technical problems for others interested in using these tools have been taken by several organizations.⁸ Additional information system tools have been suggested to address the general area of management control activities, particularly in clinic performance monitoring.⁹

The kinds of managerial activities and decisions outlined towards the bottom or *unstructured* portion of Figure 1 include many of the difficult and important decisions that family planning program managers face; in other words, many of the most important issues have not been directly addressed by the available armament of management information system tools. For example, while KAP survey tools could be useful in the strategic planning areas, in the past, only a small portion of KAP data has been directly linked to the decisions that managers of population programs face. Accumulation of data is not the same as the structuring of information to aid decision-making. Management information systems, as a matter of definition, should support management activities and decisions. The converse situation—management activities supporting the data collection process—is neither desirable nor is it effective. In short, the needs for supporting managers in their planning activities

Figure 1—Management Decisions in Family Planning

KINDS OF MANAGEMENT DECISIONS			
	Operational Control	Management Control	Strategic Planning
STRUCTURED	Inventory Control Appointment Scheduling	Clinic Budget Preparations	
	Patient Record Maintenance - client profile - followup	Short term staffing and capacity requirements	
	Accounting Systems	Scheduling of mobile teams and supervisory personnel	New service facility locations
	Staff scheduling		
	Geographical allocation	Performance monitoring "evaluation"	Target population definition
	In-service training	Short term budgeting	Longer term budgeting forecasting
		Target setting	Resource allocation
		Incentive systems	Programatic interaction with environment
		Training programs	Advertising/mass communication
		Media scheduling	
UNSTRUCTURED	Outreach allocation between followup and recruitment policy		Policy options on services offered - abortion - methods offered - MCH services - private sector and community involvement
	Patient referral specification		

are real and largely unmet. An opportunity exists to structure planning problems and link information systems to these structures so that they can be effectively utilized by managers.

Figure 1 has outlined a spectrum of management decision activities, and emphasized that a number of practical information system tools are now in use to support managers facing operational control decisions. The boxed area in Figure 1 outlines some of the important decision problems faced in areas of management control and strategic planning, where management information system tools have not yet been widely applied. The example in the following section will describe an attempt to support decision-makers facing these issues of planning and control.

Structuring Planning and Control Decisions—An Example of a Simulation Modeling Approach to the Use of Information and Reporting Systems¹⁰

Why Try to Structure Strategic Planning Activities in Family Planning?

Attempting to structure or model strategic planning issues in family planning stems from the need to understand and support managerial decision-making in this critical area. In terms of the structured/unstructured dimension of how managers approach problems (Section *Structured and Unstructured Decisions*), providing structure implies three things: clear problem definition, ability to analyze alternative courses of action, and ability to select the best course of action.

Goals for Development of This Simulation Planning Tool

The goal for developing this planning model was simply to provide a *tool for program managers to use themselves* in organizing information and in supporting strategic planning decisions. While management scientists have been advocates of models—at least their own—for some time, and the literature is full of models, diagrams, and equations, “the big problem with management science models is that managers practically never use them.”¹¹ The authors believe that this situation prevails in the population field as well. Though the population literature contains many models, their design, function and uses are largely obscure to practical managers of action programs. Experience suggests a methodology that seems to underlie development of useful models for support of managerial decision-makers.¹² The commonsense core idea is simply that since managers have the responsibility for making decisions, models which they understand and control may be used, but models which they do not control or understand will not be used.

Definition of Strategic Planning Problems in the Family Planning Environment of a Metropolitan Area—Atlanta, Georgia, USA

The family planning program in Atlanta, Georgia, will be the case in point in illustrating the problems of strategic planning for a family planning program. Beginning in the late 1930s contraception was available to the impoverished women of Atlanta through Grady Memorial Hospital,

an 1,100-bed general hospital which is the principal medical care facility for low-income people living in Atlanta. In 1962, oral contraceptives were first supplied to the hospital's clientele and in 1964, the insertion of IUDs began.¹³ In 1966, Planned Parenthood of Atlanta opened its first clinic, and a year later Atlanta's two county health departments cautiously opened their doors to women wanting contraception. In late 1968, a neighborhood health clinic also initiated contraceptive services. In all, five different agencies provided public family planning services to indigent women in Atlanta.

These five autonomous agencies readily recognized their need for a coordinated approach to Atlanta's family planning program. As the city's program grew to almost 50 clinics, and added new funding sources, the problems became acute, and the five agencies came together to form the Atlanta Area Family Planning Council. Eventually abortion services with referral for contraception and a volunteer-run hippie clinic were also added to Atlanta's public service program in family planning.

The Council's members faced many specific planning problems: setting of goals and objectives, staffing and training issues, use of outreach and paramedical workers, location of clinics, referral and switching of clients between service agencies, communication and recruitment, concern with special emphasis groups such as high-risk mothers and teenagers. A common theme for structuring a planning tool was found in the Council's interest in understanding the sources of clients needing services, when, where, and how services are in fact obtained, what services are needed and how often. A planning task force composed of Council staff, program managers and management consultants was organized by the Council to develop a planning model, which attempts to provide an explicit structure of how the managers of the major service agencies perceive their system.

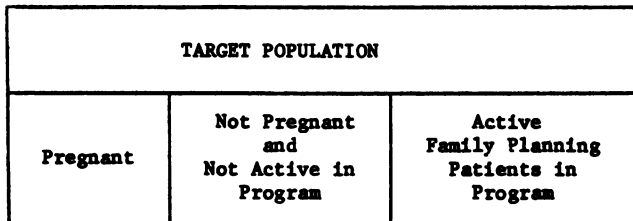
Perception of the Family Planning Services System

People concerned with family planning programs in Atlanta visualize service facilities spreading through the area, serving a Target Group of clients often defined as the reproductive-age, medically indigent population. Atlanta managers saw a common denominator between individual clinic programs emerge in terms of a concern for *patient flow*. In what ways do potential users flow into and drop out of clinic programs? How do they move between various agencies? How do they flow into and out of the eligible service population? As a means for communicating effectively with each agency potentially involved, the model was designed around a simulation of the patient flow process since it was an area of common concern.

The Atlanta area had several basic settings or channels for serving the target group: postpartum hospital programs, separate or free-standing health care centers (e.g., local health department clinics, Planned Parenthood Centers), private medical care facilities, and commercially distributed over-the-counter methods. The formal public channels use a common program measure as a primary evaluation yardstick: the number of individual patients actively receiving family planning services through all publicly supported channels.¹⁴ Figure 2 diagrams Atlanta's view of the target population as composed of three major

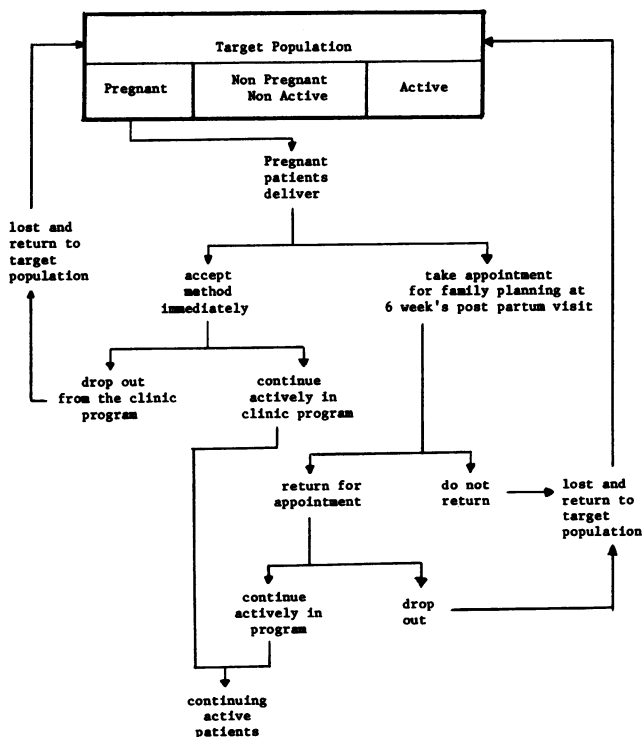
segments: Pregnant, Active in Program, and Neither Active nor Pregnant. Although a number of goals are stated for family planning such as improving maternal and child health, introducing the indigent into the health care system, and assuring that every child is a planned and wanted child, the most frequent intermediate indicator used to measure progress toward these goals in Atlanta is the prevalence of active family planning patients in the target population.

Figure 2—Program View of Family Planning Target Population



To understand how patients obtain services, each service agency director described how they perceived their own program as working. The preliminary model structure was then built to reflect the operational program environment in the user's terms, and therefore, from the first preliminary model, the program directors understand and control a planning process which evolves according to their own needs. Examples of a manager's view of the basic postpartum program and the health center clinic channels are structured in Figures 3 and 4. The general flow sequence is clearly related to events that are part of clinic program ac-

Figure 3—Postpartum Patient Flow from the Pregnant Group in the Target Population



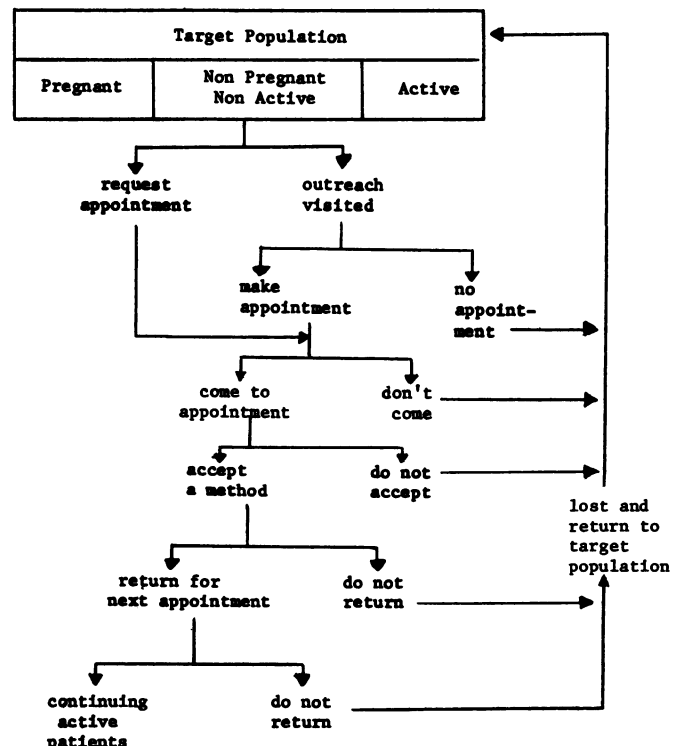
tivities or to decisions which patients make regarding their use of clinic services.

The postpartum patient flow process provides an example of the event-oriented approach. Postpartum personnel describe patient flow in terms similar to the following: each month a number of women deliver; of the patients delivering in any month, some receive family planning instruction and perhaps accept a method immediately postpartum; of those leaving the hospital with a postpartum appointment, some do not return; of those who return, some select different methods, or none at all; of those who leave with an appointment, some return for subsequent appointments. Many facets of the patient flow process are readily described in the program manager's terms as statements of the percentage of people who will move from one point in the flow diagram to the next. For example, 40 per cent of those who deliver may accept a contraceptive method immediately, and 80 per cent of the immediate acceptors may come for postpartum check-up and accept again. The patient flow diagram brings attention to critical events and decision points in the program and focuses the manager's attention on specific data collection and analysis tasks relevant to those decisions.

Model Structure

The flow diagrams that define managers' perceptions of the system for providing services are useful at a conceptual level; the next task is to convert this conceptual model structure into a practical and quantitative tool for actual planning use. Each step or event in the flow structure can be defined in mathematical terms, frequently as state-

Figure 4—Free-Standing Clinic Patient Flow from the Target Population



ments which can be recorded as a simple percentage figure characterizing the rate of flow from one point to another. For example, if 40 women in 100 accept family planning services immediately postpartum, the rate of flow of acceptance immediately postpartum in that population is 0.4. Mathematical statements characterizing each point in the structure represent a more precise form of the descriptive model which managers outlined in the diagrammatic flow structure.¹⁵

Few family planning program managers are, by training or avocation, inclined to think and plan directly in terms of statistical procedures or equations, and therefore a useable model tool must, by definition, be presented in terms that are consistent with the users' needs. For example, program managers deal constantly with patient visits. This is the concrete event at the heart of any clinic-based program and is the unit of service which underlies planning. The model therefore focuses on the flow of visits that occur over time rather than on other statistical procedures such as life-table techniques which are less comprehensible in operational terms.

Given the event-based model, the best way for the manager/model-user to communicate with and control his planning model is through English language statements that describe in words that he has first outlined on the flow diagrams and what the management support team has converted into mathematical statements for ease of computation. Figure 5 relates an example of a series of questions which have been phrased by the user/manager to express the movement, from one point to another, implied by the diagrammatic flow structure for a particular postpartum program.

A summary view of the patient flow process perceived in the metropolitan area is presented in Figure 6,

where at any point in time the target group is viewed as a closed system of three major segments, those who are Pregnant, those who are Active Contraceptors, those who are Neither Active nor Pregnant. Active patients either remain active, become pregnant intentionally (or through contraceptive failure), or discontinue method use and enter the non-active, non-pregnant group. Pregnant women either remain pregnant, deliver and perhaps obtain family planning, or they return to the non-active, non-pregnant state. Those in the non-active, non-pregnant state either remain-so, accept family planning, or become pregnant.

These flows represent the basic model structure, and in a specific program situation, managers may want to elaborate their model to include other phenomena. For ex-

Figure 6—Target Group Segments and Interaction

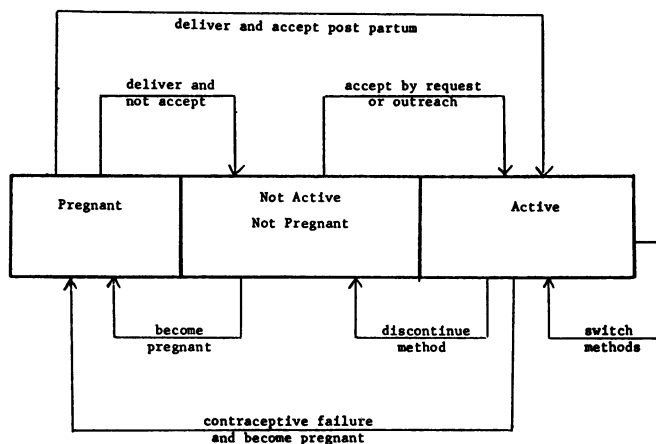
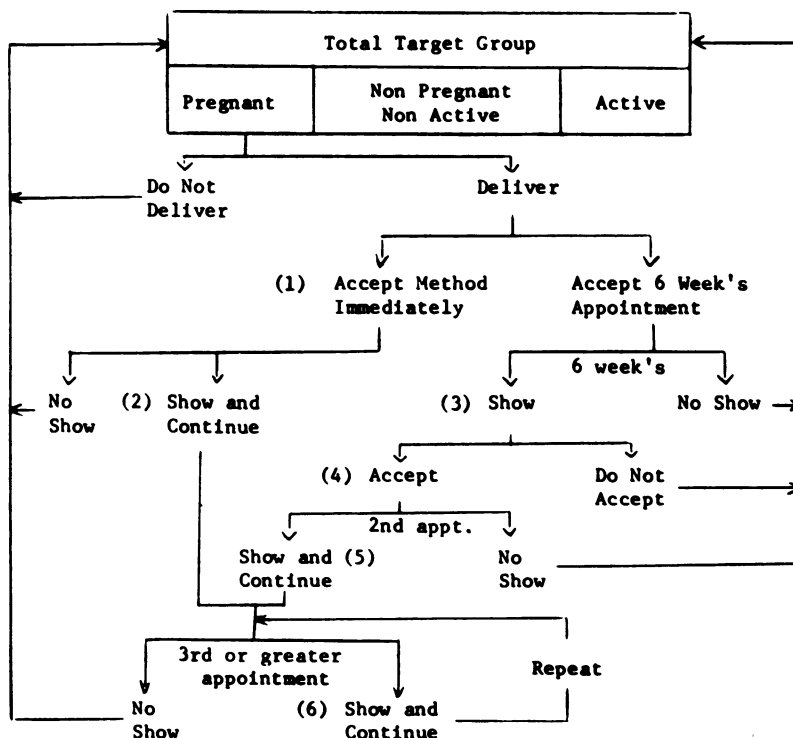


Figure 5—Question Sequence and Flow Chart Correlation for a Particular Postpartum Family Planning Program

Please enter the following post partum clinic data:

- 1: Fraction of women who will accept some method immediately:
- 2: Fraction of immediate acceptors who return for post partum 6 week's appointment:
- 3: Fraction of women who do not accept immediately, who appear for their 6 week's appointment:
- 4: Fraction of those who appear who accept some method:
- 5: Fraction of those who accept first at 6 week's who appear and continue at the next appointment:
- 6: Fraction of users who have accepted twice who return for the third appointment:



ample, the manager can include segmentation of the target population into groups reflecting different levels of experience, attitudes, or needs. He may want to specify different methods of contraception, use of private protection, inclusion of sterilization and abortion, advertising, migration and referral of patients between service agencies. This is accomplished through a *model specifications* step in which the manager selects the important factors that he wishes to include from a file of model options dealing with each of the above phenomena. The manager therefore controls model design and can expand it in a gradual, evolutionary way. In practice, he is likely to expand his planning model only to the extent that he perceives it as supporting his decision needs.

Data Sources: Actual Use of Information and Reporting Systems

At this point, the manager and the support team have completed the planning model, and in doing so have made important strides toward practical use. These include: 1) Specifying in clear language the factors which they consider important, the variables which control the process, and the underlying assumptions which will allow others to understand, comment and criticize; and 2) specifying precisely the pieces of information required to quantify the planning process.

This latter point is extremely important, in view of the complexity of data sources facing the manager in many family planning situations. Even a single clinic or agency may be confronted with clinic visit and medical records, outreach worker reports, budgets, target population estimates, opinion and survey results, clinic capacity figures, as well as considerations of political pressure and prospects for future funding. Where there are several programs or agencies involved in one area, these inputs are likely to be compounded. The model structure points to important pieces of information hidden within this mass of data, and at the same time minimizes distraction by the seductive abundance of data that is largely irrelevant to the set of questions asked and decisions faced by the manager.

Figure 7 outlines examples of the variety of data sources which can be integrated to provide input information for the planning model tool. Both "hard" information and reporting systems (client record systems, budgets and surveys), and "soft" data sources (managerial judgment and expertise) provide important information. It is important to note that the basic planning model structure only requires data estimates for the parameters in the top portion of the table. The parameters and data sources listed in the lower portion of the table represent the variety of possible additional inputs that a manager might choose to employ, depending on the number of options he selects in the initial model specifications step. The pieces of information abstracted reflect the straightforward questions arising from the model structure: the number of visits, the per cent of return visits, the per cent of acceptors selecting pills, the number of deliveries, the number of months between appointments, the actual budget figures, projected funding levels, availability of abortion services, etc. No complex statistical efforts are required of the manager. What the planning model provides is a vehicle for information use and manipulation. While it encourages exploitation of existing

information and reporting systems, and may point to desirable changes in the way information may be collected, it is not itself a reporting system in the traditional sense.

Figure 7—Input Data Sources for Metropolitan Planning Model

<u>Possible Model Planning Parameters</u>	
I. Basic Input Parameters	
Number of Births	Hospital and vital records
Initial levels of service utilization	Patient/clinic records
Flow rates	
Acceptance Postpartum and Non Postpartum	"
Percent accepting various methods	"
Percent returning for follow-up visits	"
Time intervals between appointments	"
Contraceptive method effectiveness	Research studies
II. Optional Input Depending on Manager's Model Specification	
Switching between agencies	Patient/clinic records
Fieldworker referral	Outreach worker records
Recruitment and follow-up	"
Cost of providing services	Budget and expenditure records
Projected funding levels	Managerial judgment
Service capacity	Clinic experience and managerial judgment
Non-clinic continuance	Surveys
Private use of contraceptives	Surveys
Migration and age structure	Surveys, judgment
Advertising response	Experiments

How the Planning Model Methodology is Used

Though a computer is used to carry out planning model calculations, few program directors have any interest in getting involved with the technical details of computers. In addition, most managers are unlikely to delegate planning responsibilities to technical staff, and so to insure that he remains in control of the planning process, an English language, interactive computer system is used.¹⁶ Using a typewriter console, the manager enters the relevant data into his planning model, which is stored in a timesharing computer. The portable typewriter terminal is connected through an ordinary telephone to the computer and the manager can use it at any convenient site—in his office, in a field training session in a clinic, or at home at his convenience. There are three major steps which the manager takes:

- **Fitting:** Typically, the manager begins by running the model using data for a previous time period, to assess whether the model specified and the data entered, when projected over time, do indeed fit actual events acceptably. The process of fitting historical data is important in establishing confidence that projections are reasonable for planning purposes, and that the model is credible in the user's eyes. When the program manager reaches this level of confidence, he can exploit his planning tool for goal-setting, exploring policy alternatives and budget-planning.

- **Simulation:** By running his model for a one-, two- or three-year period, the planner can examine expected program performance under alternate planning assumptions.

- **Tracking:** After a "best" annual plan has been specified by considering various simulation alternatives, the

model is used to compare *actual* and *predicted* results. The procedure, called "tracking," is done at 3-6 month intervals. Examining the difference between actual and predicted performance will help to diagnose program problems, and support adaptive control of the program.

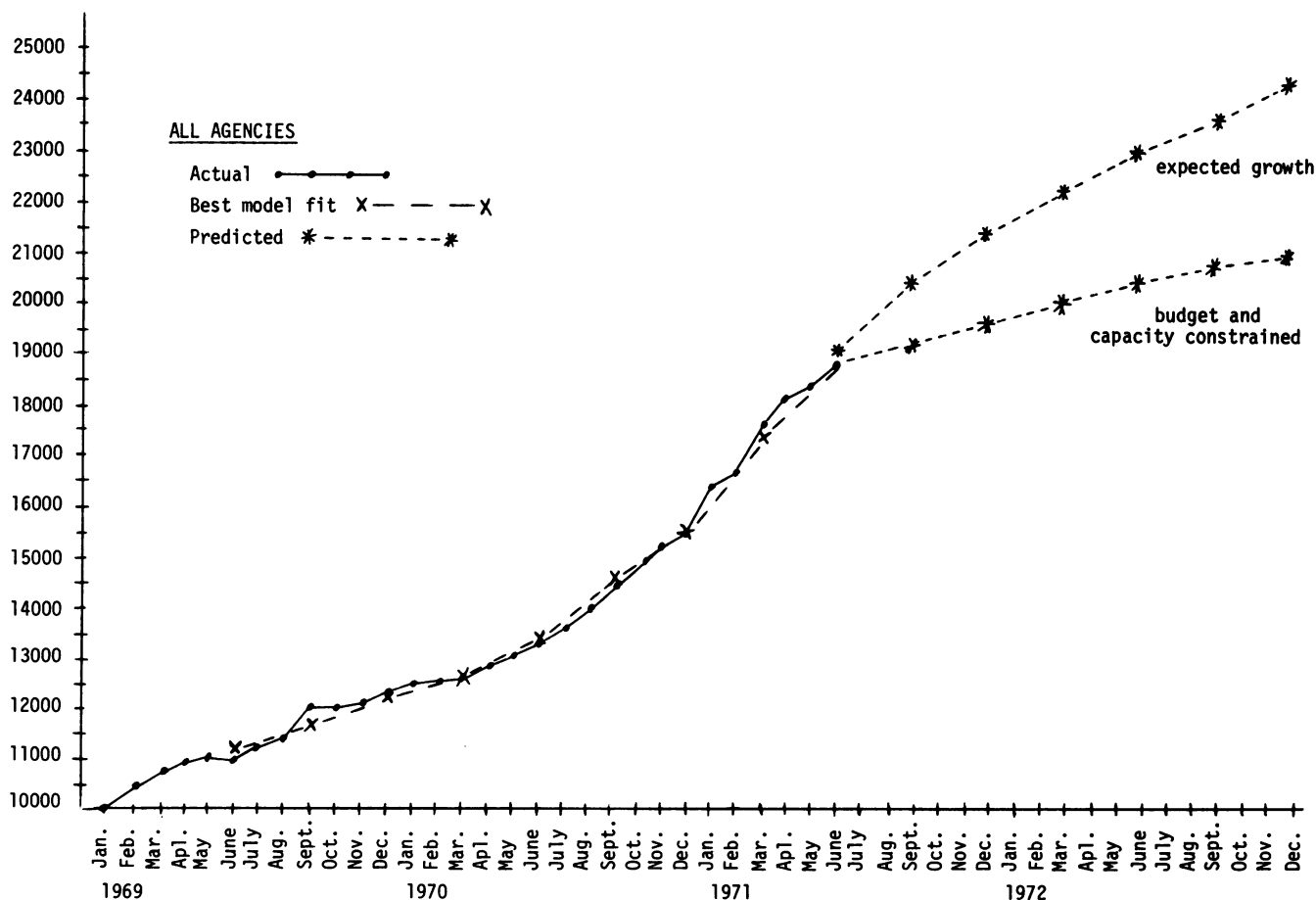
The patient flow process provides the program manager with a means for relating actual resource inputs—as measured by his service statistics in terms of patient visits, selection of methods and the probabilities of continuation, to measures of output—such as new acceptors, active patients, percentages of target group served, and couple-years of protection. By adding budget data and capacity information, the user can also obtain cost and capacity utilization estimates. Cost effectiveness measures in terms of cost per visit, per active patient, and per couple-year of protection are available as model outputs. Alternative policy considerations, such as increased attention to referral systems, outreach, sterilization, advertising, or abortion services can be examined. The user enters the new data for a specific alternative and the additional calculations are run in a few seconds, giving rapid assessment of each alternative in terms of growth potential. The setting of arbitrary objectives is avoided, and examination of realistic policy and program growth alternatives can lead to internalized objectives to which program staff can share a commitment.

An Example of Model Use

A recent example in Atlanta's experience throws an interesting light on the way funding agency requests for budget documentation can be creatively met. The Atlanta Area Family Planning Council was faced with a probable 1972 budget ceiling equal to the 1971 level. Rather than simply submitting budget requests from their member agencies asking for more inputs for clinics, personnel and supplies at either the present or next year's hoped for level, council staff used their planning model to document the Area's output projections under both constrained and expanded program efforts.¹⁷ Figure 8 shows the projection over a two-year period. In the next budget year of 1972, constrained budget levels would produce 2,900 fewer active patients, 12 per cent below expected growth, with a loss of 2,300 couple-years of protection, and an increase in cost per couple-year of contraceptive use. Moreover, to remain within program capacity at the lower budget, and continue to serve the existing patient load, approximately 240 women would have to have been refused services as new patients each month.

While this anecdotal situation did resolve favorably, in general, a soundly data-based orientation towards input/output analyses for budget and resource allocation at

Figure 8—Active Family Planning Patients at Major Service Agencies in Atlanta, Georgia Using Modern Methods



the program level should be an incentive for funding agencies to evaluate such requests seriously. Rewarding such local initiative should have positive effects beyond the particular program in question. Other local programs may be stimulated to improve their use of data in the planning process when they see such management activity produce effective growth and the funding to sustain it. Funding agencies in turn should be better able to evaluate and monitor local program performance when input/output measures are a required element in every plan submitted.

Conclusion

Initial experiences in Atlanta, which combine the data base provided by a service statistics system with the development of a user-oriented patient flow model for strategic planning, indicates that program managers are interested in using such tools to organize and exploit the variety of information sources and reporting systems that surround family planning programs. Designed to be used by program directors in their own office via a typewriter terminal, the model is controlled in English and requires no knowledge of, or detailed interest in, computers. As a practical means for combining program data, experience and judgment, the model encourages examination of alternative program strategies and formulation of realistic, data-based program plans. It represents an attempt to structure the planning problem and link family planning information systems to managerial control and strategic planning decisions. If this tool in a generalized form proves useful in other settings, then it may represent a meaningful aid to improve management in family planning.

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